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ABSTRACT

Long term criteria of college performance, i.e., graduation in four years, cumulative GPA, credits earned, and graduating major, were studied in relation to a comprehensive pre-college battery administered in the high school (HS) junior year. Despite restricting the sample to 1,633 university students who had progressed to junior standing in three years, HS GPA correlated as highly with cumulative college GPA as it does with freshman GPA in broad, national samples (.51). HS GPA was also the best predictor of graduation and credits earned, the other predictors augmenting only slightly in multiple correlation. Despite the social significance of graduation as a criterion of academic performance, it was only predicted poorly. Graduating major fields were more related to interests than to aptitudes or HS GPA, but the extreme asymmetry of these criteria precluded good prediction in a practical sense. (Author)

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Longitudinal Criteria of College Achievement Predicted from Aptitude, Achievement, and Interest Measures

Patricia W. Lunneborg

Long-term criteria of college performance, i.e., graduation in four years, cumulative GPA, credits earned, and graduating major, were studied in relation to a comprehensive pre-college battery administered in the high school (HS) junior year. Despite restricting the sample to 1,633 university students who had progressed to junior standing in three years, HS GPA correlated as highly with cumulative college GPA as it does with freshman GPA in broad, national samples (.51). HS GPA was also the best predictor of graduation and credits earned, the other predictors augmenting only slightly in multiple correlation. Despite the social significance of graduation as a criterion of academic performance, it was only predicted poorly. Graduating major fields were more related to interests than to aptitudes or HS GPA, but the extreme asymmetry of these criteria precluded good prediction in a practical sense.

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Longitudinal Criteria of College Achievement Predicted from Aptitude, Achievement, and Interest Measures

Ten years ago in his comprehensive review of research in academic prediction Lavin (1965) noted that most studies predicted grades simply in the freshman year and that more longitudinal studies were needed. Nonetheless, prediction beyond freshman GPA or freshman dropout continues to be a rarity (Siegelman, 1971; Tittle et al., 1974). Now as then, however, the utility of college admissions indices cannot be adequately judged without a more complete understanding of these predictors with long-term criteria such as cumulative college GPA, graduation, and graduating major. Certainly it is as important to know the long-term predictability of admissions measures as it is to know how well they forecast short-term success. The purpose of the present study, then, was to compare the effectiveness of three types of pre-college measures in the prediction of various long-term criteria of college performance.

The scant literature presents somewhat conflicting evidence in comparing achievement vs. aptitude variables, but high school grades (HS GPA) appear to do a better job of predicting four-year achievement than the SAT. In support of HS GPA as opposed to aptitude tests is Siegelman's (1971) study where HS GPA was superior to SAT-V and SAT-M in both male and female graduates of CCNY in predicting their cumulative college grades. Among males SAT-V correlated only .10 with college GPA, SAT-M only .03, with the combination of SAT and HS GPA being inferior to prediction from HS GPA alone! Similarly, Johansson and Rossman (1973) at Macalester

College found HS rank to differentiate between male college failures vs. males who persisted or withdrew voluntarily, while SAT-V and SAT-M differences among these groups were not significant. But among their females SAT-V and SAT-M scores differentiated better than HS rank. Other evidence in favor of the SAT resulted from the Farver et al. (1975) predictions of senior cumulative GPA at the University of Maryland for black and white, male and female graduates separately. They report that HS GPA carried more weight in multiple correlations with freshman GPA than with later grades and was a particularly poor predictor for black males, contributing not at all in predicting their college cumulative GPA. These authors felt that SAT-V was the most consistent predictor over the four years and that HS GPA was a "less important" predictor as time passed.

When the criterion of four-year achievement has been graduation, again, it seems that achievement measures predict it better. Enger and Whitney (1974) found HS rank superior to ACT Composite Score in predicting graduation in four years at the University of Iowa, and Nicholson (1973) at Brown University found HS rank and the College Board Achievement Test superior to SAT-V and SAT-M in differentiating graduates with honors, graduates without honors, and dropouts. While Johansson and Rossman (1973) reported no success in predicting graduation from nonacademic variables such as Omnibus Personality Inventory and Allport-Vernon-Lindzey Study of Values scores, Nicholson reported that nonacademic measures of socioeconomic status and counselor's ratings outperformed academic measures in distinguishing between college graduates (without honors) and

dropouts. His results are similar to those of Rose and Elton (1971) who found that both academic (lower ACT Composite) and nonacademic variables (higher Nonconformity and Masculine Role) correlated with dropping out of the University of Kentucky among male students who were vocationally undecided at college entrance.

In predicting a third kind of longitudinal criterion of college performance, the graduating major, a study by Elton and Rose (1970) serves as a prototype. They concurred with Stahmann's (1969) conclusion that academic and nonacademic (interest, personality) measures are inferior to freshman choice of major in predicting graduating major. But even freshman major only exceeded base-rate expectancies in predicting senior major for three of their six major groups classified by Holland's schema. Thus, in contrast to the predictability of graduation and grades, occupational choice as reflected through graduating major is a relatively unpredictable longitudinal criterion of college study.

Method

Subjects. Of the 3,000 freshmen entering the University of Washington (UW) autumn 1971 who had taken the Washington Pre-College (WPC) test battery in their high school (HS) junior year, 1,633 were registered three years later, spring 1974, who had 90 or more credit hours (junior standing). This sample contained 45% females and had a mean age at time of testing of 16.5.

Predictors. Data from the WPC battery included the "pure" achievement measures of HS GPA's in English, mathematics, natural science, social science, foreign language, electives, and overall. The battery's aptitude/achievement test scores included seven verbal and six quantitative scores plus spatial

ability and mechanical reasoning. Age and sex were also predictors. Interest scores were provided by the Vocational Interest Inventory or VII (Lunneborg, 1975) in Roe's (1956) eight occupational groups and are designated as follows: Service (SER), Business Contact (BUS), Organization (ORG), Technical (TEC), Outdoor (OUT), Science (SCI), General Cultural (CUL), and Arts & Entertainment (ART). Another predictor was an interest differentiation score which was the absolute value of the difference between a person's highest and lowest VII standard scores (Max-Min Dif).

Criteria. The longitudinal criteria of greatest interest were from the "senior year": (1) graduation in four years, by spring 1975 (counted as graduated were also students who had not applied for graduation but who had met graduation requirements), (2) UW cumulative GPA spring 1975 (or last quarter attended if withdrew after spring 1974 or graduated), (3) total credits earned including transfer credits as of spring 1975, and (4) major as of spring 1975. For this latter criterion, majors were classified two ways: (1) by field of study comparable to Stahmann's (1969) analysis using the ten areas of Architecture, Engineering, Fisheries/Forestry, Health Professions, Humanities, Arts, Social Science, Natural Science, Business Administration, and No Major, and (2) by major as classified by Roe's system. There is no University major comparable to Roe's Business Contact so this group is missing. These two methods of classification allowed a test of Elton and Rose' (1970) conclusion that predicting majors classified by a theoretical system is more efficient than predicting majors classified by general field of study.

There were, in addition, three earlier "junior year" criteria: (1) UW GPA spring 1974, (2) credits earned as of spring 1974, and (3) Roe group of major spring 1974.

Analyses. All predictors were correlated with all criteria. Then, the 20 "senior year" criteria (3 academic measures, 10 fields of study, 7 Roe groups) were the object of multiple prediction from sixteen selected ability and interest measures. These were HS GPA, Vocabulary, English Usage, Quantitative Skills, Mathematics Achievement, Spatial Ability, Mechanical Reasoning, and the nine VII interest scores which included Max-Min Dif. Predictors were selected in a step-wise fashion for each criterion until no significant increase (.05 level) in criterion variance was attained.

Results

For 1620 degrees of freedom an r of .06 is significant at the .01 level and an r of .08 at the .001 level. Thus, only r's of .25 or greater will be considered here as having accounted for a meaningful amount of criterion variance.

First the junior year criteria: (1) The best predictor of cumulative GPA spring 1974 was HS GPA (.51) with the separate HS GPA's correlating at .40 or higher except for Electives GPA (.28). The best aptitude test predictors were English Usage (.41) among the verbal tests, and Mathematics Achievement (.38) among the quantitative tests. The interest test scores did not predict spring 1974 GPA. (2) The best predictor of credits earned was again HS GPA (.29). While the various aptitude tests correlated significantly with credits earned, test r's were uniformly lower than GPA r's.

The interest tests essentially did not predict credits earned. (3) The prediction of spring 1974 major area was disappointing, the highest r's with each Roe major being: SER, .12 with VII SER; ORG, .18 with VII ORG; TEC, .30 with Mechanical Reasoning; OUT, .19 with VII OUT; SCI, .20 with VII SCI; CUL, .14 with VII CUL; ART, .27 with VII ART; and no major, -.19 with HS Math GPA. While such r's provide modest validity evidence for the VII, they afford poor prediction in a practical sense.

Looking now at the three academic senior year criteria with simple r's in parentheses: (1) Graduation in four years was best predicted by HS GPA (.23) while the various aptitude test correlations ranged from -.03 for Mechanical Reasoning to .14 for English Usage. Like the aptitude tests, the interest scores, age, and sex were uncorrelated with graduation. (Graduation was achieved by 50% of the 1,633 students.) (2) UW cumulative GPA spring 1975 was best predicted by HS GPA (.51) with the other high school GPA's having r's of .40 or better, except for Electives GPA (.29). The best aptitude tests were English Usage (.42) and Quantitative Skills (.34). Age, sex, and the interest scores were uncorrelated with spring 1975 GPA. (3) Total credits earned by spring 1975 was best predicted by HS GPA (.23) with age, sex, aptitude and interest measures essentially uncorrelated with this criterion.

Table 1 presents first the results of stepwise predictor selections for the three academic criteria. The most important contributor to all three was HS GPA. With graduation in four years HS GPA correlated .23, so that the multiple correlation of .25 represents an increase in variance accounted for of only 1%. Similarly, HS GPA correlated .51 with cumulative

GPA, while the R produced by adding five other predictors only rose to .57. Lastly, the r of HS GPA with credits earned in four years was .23, with VII TEC being the only other variable to add significantly to HS GPA (R = .24). While not accounting for much variance in a practical sense, the VII interest scores augmented HS GPA more often than the various aptitude tests in predicting the three academic criteria.

Insert Table 1 about here

Following the three academic criteria in Table 1 are the ten fields of study. The numbers of students in these ten areas ranged from 62 in Health to 362 majoring in Social Science. The poorest area to predict was Architecture, R = .14; the best predicted area was the Engineering major, R = .37. HS GPA was selected only twice, in predicting Health professions and No major. Overall, the VII scores contributed the most to predicting fields of study.

Following the ten fields of study in Table 1 are the seven Roe major criteria. There the numbers of students in each group ranged from 46 in Service majors to 571 in Science majors, which group included both natural and social sciences. The R's seem comparable in magnitude to those obtained over the ten fields of study, ranging from .12 for Service to .36 for Technical. Again, the various VII scales were the most important contributors to predicting these majors, but one or more achievement/aptitude measure was involved in predicting each major except Fisheries/Forestry and Service.

Discussion

Perhaps the most remarkable statistic in all of the above is the simple correlation of .51 between HS GPA and four-year college GPA. Remembering that the present sample was restricted to students who had survived three years, achieving at least junior standing in that time, this *r* is identical with correlations between HS GPA and freshman GPA for large, broad, national samples, .50 for males, .51 for females (Astin, 1971). Another factor beside sample restriction that should have reduced the correlation between HS GPA and cumulative college GPA is grade inflation, particularly in upperclass coursework. Thus, the strength of the relationship between grades in high school and long-term grades in college supports the continued use of HS GPA as the primary admissions index for post-secondary education. Indeed, other measures only produced an *R* of .57, even though the aptitude/achievement tests, on the average, correlated approximately .30 with HS GPA.

A second finding that needs to be considered is the poor predictability of that very important criterion of college success, graduation, in this case, graduation in four years. Of the 3000 students who entered four years previously, students who, incidentally, were at the highest level of admissions "selectivity" (level 7, Astin 1971, Table 3-6), only 27% of them had graduated four years later--and that number included some who had met graduation requirements but still had not applied for their degrees. HS GPA, again, correlated higher than any other single predictor with this dichotomous criterion, achieved by half of the restricted sample, with very little added by other predictors. The *R* of .25 for graduation compares

favorably with previous results at the University of Iowa where Enger and Whitney (1974) report a .19 for ACT Composite and .28 for HS rank with graduation in four years. The present finding thus illustrates two points made by Astin (1973) regarding this particular long-term criterion: student ability is the most important determiner of it and, as criteria of the outputs of higher education go, it is the worst to predict. "In general, our ability to account for variance in college completion is meager; among our various benefit measures, this one yields the smallest correlations with antecedent variables" (Astin, 1973, p. 125). Thus, as the job market becomes more dismal and the tendency to protract one's college days increases, and the reasons for going to college change, graduation can be expected to become even more difficult to predict. College administrators may find themselves falling back upon GPA as the most reliable indicator of academic achievement.

With respect to the third kind of longitudinal criterion, the graduating major, classifying majors by Roe's schema held no particular advantage over classifying majors by broad fields of study. Either way, predicting major is difficult. Clearly, this choice was at least as much related to interests as it was to aptitude and prior achievement, but the amount of variance in each major group that could be accounted for was disappointing from a counseling practitioner's point of view. It should be noted, however, that the extreme asymmetry of these criterion measures (e.g., 4% of the sample majored in Fisheries/Forestry, 96% did not) precludes their ever being strongly related to any normally distributed predictor.

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Table 1

Predictor Selections for College Senior Year Criteria

from Stepwise Multiple Regression Analyses

Criterion	Predictors in order	R	R^2	F
Graduation in four years	HS GPA, VII CUL, VII BUS	.25	.06	4.92*
Cumulative GPA	HS GPA, English Usage, Quant Skills, VII SER, VII BUS, VII CUL	.57	.32	8.39**
Credits in four years	HS GPA, VII TEC	.24	.06	9.62**
Architecture major	VII SER, Vocabulary, VII ART, Quant Skills	.14	.02	5.16*
Engineering major	Mechanical Reasoning, VII TEC, VII ORG	.37	.14	13.72***
Fish/Forestry major	VII OUT, VII SER, Max-Min Dif, VII SCI	.22	.05	4.96*
Health Profession major	VII SCI, HS GPA, VII CUL	.17	.03	7.25**

Note. The F values are those associated with the increase in R^2 by the last selected variable. Selection ceased when this F was not significant at the .05 level.

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 1 (continued)

Criterion	Predictors in order	R	R^2	F
Humanities major	Vocabulary, Quant Skills, English Usage, Math Achieve, VII ART, VII CUL	.22	.05	4.59*
Arts major	VII ART, Math Achieve, Max-Min Dif, VII OUT	.32	.10	8.81**
Social Science major	VII TEC, VII SCI, VII ART, Mechanical Reasoning, VII ORG	.20	.04	5.26*
Natural Science major	VII SCI, Math Achieve, Quant Skills, VII ORG, VII ART	.32	.10	4.36*
Business Administration major	VII ORG, VII BUS, Math Achieve, Vocabulary	.26	.07	15.43***
No major	HS GPA, VII CUT, English Usage	.20	.04	4.39*
SER major	VII SER, VII CUL	.12	.02	4.55*
ORG major	VII ORG, VII BUS, VII TEC, Mechanical Reasoning, Quant Skills, English Usage	.27	.08	11.26**

Table 1 (continued)

Criterion	Predictors in order	R	R^2	F
TEC major	Mechanical Reasoning VII TEC, VII ORG, Vocabulary, Quant Skills	.36	.13	5.44*
OUT major	VII OUT, Mechanical Reasoning, VII SER, VII SCI, Max-Min Dif	.26	.07	4.00*
SCI major	VII SCI, VII SER, HS GPA, Mechanical Reasoning	.27	.07	4.77*
CUL major	VII CUL, Quant Skills, English Usage, VII SCI, VII ORG, VII TEC	.30	.09	6.24*
ART major	VII ART, Math Achieve, Max-Min Dif, VII OUT	.31	.10	8.52**